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(71)Applicant : SEIKO EPSON CORP

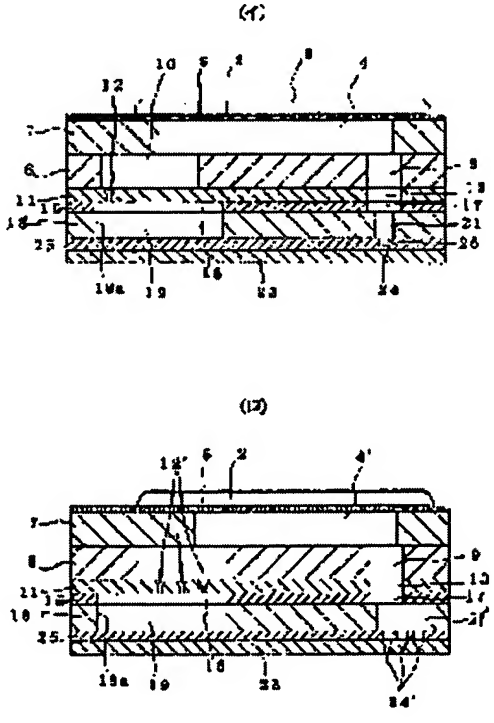
(72)Inventor : MIYAZAWA YOSHIO
TANAKA YUJI
USUI MINORU
HARA KAZUHIKO
KATAKURA TAKAHIRO
SAKAI MARI

(54) LAMINATE TYPE INK JET RECORDING HEAD

(57)Abstract:

PURPOSE: To secure the full compliance to the dropwise delivery of ink by removing easily the air bubbles which have entered a common ink chamber and increasing the size of the common ink chamber.

CONSTITUTION: A flow passage limiting hole 12 is formed close to a wall face 19a at a distance from the nozzle opening side of a common ink chamber 19, a dummy pressure producing chamber 4' is provided at the end part of the common ink chamber 19 and a plurality of flow passage limiting holes 12' are formed in communication with the dummy pressure producing chamber 4' and in the width direction of the common ink chamber 19. The ink near the wall face 19a is allowed to flow in a set direction away from the wall face and directed in a certain direction due to the resistance of the ink to adherence and air bubbles are carried off in this stream and from the flow passage limiting hole 12 they are sucked into the pressure producing chamber 4 and then dischaged to outside. Due to the formation of the plurality of the flow passage limiting holes 12 near the end part of the common ink chamber 19, even if the width in this region is increased, the stagnation of the ink is not caused.



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CLAIMS

[Claim(s)]
[Claim 1] While closing another side of the pressure generating room formation member which the closure of one field is carried out by the elastic plate which has a piezo-electric diaphragm on a front face, and forms an oscillating member in it, and said elastic plate, and forms a pressure generating room, and this pressure generating room formation member While having the passage limit hole which gives passage resistance to the ink supply way to the covering device material equipped with the free passage hole which is open for free passage in the both ends of said pressure generating room, and said pressure generating room Said pressure generating room, and the passage limit plate equipped with the free passage hole open for free passage, the common ink room which is open for free passage in said each pressure generating room through said passage limit hole, And the common ink room formation plate equipped with the free passage hole which is open for free passage in said pressure generating room, The nozzle plate equipped with the nozzle orifice connected to said pressure generating room through said each free passage hole while closing the other sides of said common ink room formation plate, In the ink jet type recording head which carries out the laminating of the ** to sequence, respectively, and it comes to fabricate to one It is leaned and formed in the wall surface side on which said passage limit hole separated from said nozzle orifice side of said common ink room. Moreover, the laminating mold ink jet type recording head by which the dummy pressure generating room is formed in the trailer of said common ink room, the pressure generating room of said dummy is made open for free passage, and two or more passage limit holes are formed crosswise [of said common ink room].

[Claim 2] The laminating mold ink jet type recording head of claim 1 in which the pressure generating room of said dummy is made open for free passage, and two or more nozzle orifices are formed.

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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] a part of pressure room which this invention opens for free passage to a nozzle orifice -- the sheet metal of a piezo-electric diaphragm is stuck on a field, and it is related more with the recording head which a pressure room is compressed [recording head] with this piezo-electric diaphragm, and generates an ink droplet, and a piezo-electric diaphragm, a pressure room formation member and the ink jet type recording head that carried out the laminating configuration of the elastic plate at one at a detail.
[0002]
[Description of the Prior Art] some elastic plates which constitute the pressure generating room -- a field -- a piezo-electric diaphragm -- sticking -- the deflection of a piezo-electric diaphragm -- since the ink jet type recording head which changes the volume of a pressure room with a variation rate, and generates an ink droplet can carry out the variation rate of the large area of a pressure generating room, it is equipped with the description that it can be stabilized and an ink droplet can be generated. The elastic plate 31 which such a recording head has the piezo-electric diaphragm 30 on a front face as shown in drawing 5 (b), and forms an oscillating member, While closing the other sides of the pressure generating room formation member 33 which forms the pressure generating room 32, and the pressure generating room formation member 33 The covering device material 37 which has the free passage hole 36 which connects the free passage hole 35 which connects the pressure generating room 32 and the passage limit hole 34, the pressure generating room 32, and a nozzle orifice 41, The common ink room formation plate 40 equipped with the free passage hole 39 which connects the common ink room 38 which the closure of one field is carried out by the covering device material 37, and is open for free passage in each pressure generating room 32 through the passage limit hole 34, and a nozzle orifice 41 and the pressure generating room 32, The laminating of the nozzle plate 42 equipped with the nozzle orifice 41 which closes the other sides of the common ink room formation plate 40 is carried out to sequence, respectively, and it is constituted by one.
[0003] In order that such an ink jet type recording head may make small loss of ink ** at the time of compression of the pressure generating room 32 as much as possible The passage limit hole 34 which has passage resistance of nozzle orifice extent mostly is formed between the common ink room 38 and the pressure generating room 32. This on the relation of the pressure generating room 32 mostly arranged on the center line, exchange of an ink cartridge, and in order to recover regurgitation capacity again When put a cap on a nozzle plate 42, negative pressure is made to act through this and ink is made to discharge compulsorily from a nozzle orifice 41 Although the ink of the common ink room 38 is attracted by the nozzle orifice 41 through the passage limit hole 34, since there are very few the amounts, As shown in this drawing (b), it does not become the big flow which moves at the common whole ink room, but there is a problem that the air bubbles which invaded into the trailer of a common ink room especially can stagnate, and cannot eliminate. Although the device which constitutes the trailer of a common ink room so that it may be tapering off as shown in this drawing (b), and lessens stagnation of the ink in a trailer as much as possible is made in order to solve such a problem, the area of a common ink room becomes small and there is a problem that the compliance of sufficient magnitude for expulsion of an ink droplet cannot secure.
[0004]
[Problem(s) to be Solved by the Invention] It is offering the new laminating mold ink jet type recording head which this invention's can be made in view of these problems, and the place made into the purpose can eliminate easily the air bubbles of a common ink room, especially a trailer, and can give sufficient compliance for a common ink room.
[0005]
[Means for Solving the Problem] In order to solve such a problem, it sets to this invention. While closing another

side of the pressure generating room formation member which the closure of one field is carried out by the elastic plate which has a piezo-electric diaphragm on a front face, and forms an oscillating member in it, and said elastic plate, and forms a pressure generating room, and this pressure generating room formation member While having the passage limit hole which gives passage resistance to the ink supply way to the covering device material equipped with the free passage hole which is open for free passage in the both ends of said pressure generating room, and said pressure generating room Said pressure generating room, and the passage limit plate equipped with the free passage hole open for free passage, the common ink room which is open for free passage in said each pressure generating room through said passage limit hole, And the common ink room formation plate equipped with the free passage hole which is open for free passage in said pressure generating room, In the ink jet type recording head which carries out the laminating of the nozzle plate equipped with the nozzle orifice connected to said pressure generating room through said each free passage hole while closing the other sides of said common ink room formation plate to sequence, respectively, and it comes to fabricate to one It is leaned and formed in the wall surface side on which said passage limit hole separated from said nozzle orifice side of said common ink room. Moreover, the dummy pressure generating room was formed in the trailer of said common ink room, the pressure generating room of said dummy is made open for free passage, and two or more passage limit holes were formed crosswise [of said common ink room].

[0006]

[Function] If discharge of compulsory ink is performed, since the passage limit hole which is open for free passage in each pressure generating room adjoins the wall surface of a common ink room and is prepared, the direction which is distant from a wall surface with an adhesion viscous drag, i.e., the flow which leaned toward one side, produces the ink near the wall surface. Consequently, the common air bubbles of the ink interior of a room ride this flow, are absorbed by the pressure generating room from a passage limit hole, and are discharged outside from a nozzle orifice. Moreover, since two or more formation of the passage limit hole is carried out, the stagnation of the trailer of a common ink room of a trailer decreases, therefore it enlarges width of face of a trailer, and it becomes possible [securing required sufficient compliance] to the ink regurgitation at a common ink room.

[0007]

[Example] Then, based on the example illustrating the detail of this invention, it explains below. Drawing 1 and drawing 2 are the decomposition perspective view showing one example of this invention, and the sectional view showing the structure near [linked to one common ink room] the pressure generating room. The sign 1 in drawing The drive electrode 5 is formed in the front face of the elastic plate 2 which consists of sheet metal of a zirconia with a thickness of about 10 micrometers so that the pressure generating room 4 mentioned later may be countered, and the piezo-electric diaphragms 3 and 3 which consist of PZT on it, and 3 .... are fixed, and it consists of piezo-electric diaphragm mechanical components.

[0008] 7 is the pressure generating rooms 4, 4, and 4 to ceramic plates, such as the thickness which is a spacer and was suitable for forming the pressure generating room 4, for example, a 150-micrometer zirconia etc., (ZrO2).... The through-holes 6 and 6 and 6 .. which were in agreement with the configuration are drilled at constant pitch, and it is constituted.

[0009] And trailer 19b of the common ink room 19 is made open for free passage, and as shown in drawing 3 , the dummy pressure generating room 4, i.e., the pressure generating room of the dummy used in order not to participate especially in printing but to merely discharge ink compulsorily from a nozzle orifice, is formed.

[0010] eight -- a pressure -- generating -- a room -- four -- and -- a dummy -- a pressure -- generating -- a room -- four -- ' -- other -- a field -- closing -- a covering device -- material -- it is -- a pressure -- generating -- a room -- four -- four -- four .... and -- four -- ' -- an end -- a wall surface -- four -- a -- near -- connecting -- the -- one -- a free passage -- a hole -- ten -- ten -- ' -- a pressure -- generating -- a room -- four -- four -- four .. and -- four -- ' -- the other end -- being open for free passage -- the two -- a free passage -- a hole -- nine -- nine -- ' -- forming -- having -- **** .

[0011] the 1st free passage hole 10 and 10 and 10 .... were shown in drawing 3 -- as -- the end section -- the pressure generating rooms 4, 4, and 4 .. wall surface 4a of 4', and near 4a' -- open for free passage -- moreover, the other end -- the pressure generating rooms 4, 4, and 4 .... It is narrowly formed a little rather than .... and 4'. an outside [' / 4] -- projecting -- **** -- the pressure generating rooms 4, 4, and 4 -- moreover, extent 4, 4, and 4 into which the liquid with which die length flowed into the end as a jet can be made to flow as a laminar flow in the other end, for example, pressure generating rooms, -- it is constituted by .... and the die length which is about [of the overall length of 4'] 1/10.

[0012] These three members 1, 5, and 8 are constituted as a unit, respectively, and are attached in the passage limit

plate 11 mentioned later.
[0013] 11 is the passage limit plate which served as the unit stationary plate by which each unit mentioned above to one field is fixed to a position with adhesives. As shown in drawing 3 , near [common] the wall surface 19a of the ink room 19, at the edge of the 1st free passage hole 10 closely Have passage resistance almost equivalent to a nozzle orifice 24, and the passage limit hole 12 which the 1st free passage hole 10 side extended is formed. Moreover, the ink feed hopper 14 which supplies ink to the common ink room 20 which the free passage hole 13 linked to a nozzle orifice 31 connects with the ink tank which is not illustrated further, and is mentioned later is formed in the part which counters the 2nd through-hole 9.
[0014] and -- a dummy -- a pressure -- generating -- a room -- four -- ' -- being open for free passage -- the -- one -- a free passage -- a hole -- ten -- ' -- **** -- drawing 2 -- (b) -- having been shown -- as -- a pressure -- generating -- a room -- four -- passage -- a limit -- a hole -- 12 -- comparing -- the whole -- passage -- resistance -- small -- becoming -- as -- and -- a trailer -- 19 -- b -- the cross direction -- uniform -- flow -- being generated -- as -- plurality -- passage -- a limit -- a hole -- 12 -- ' -- 12 -- ' -- 12 -- ' -- being common -- ink -- a room -- 19 -- a trailer -- 19 -- b -- the cross direction -- preparing -- having -- **** .
[0015] 15 is a heat joining film for joining the common ink room configuration plate 18 and the passage limit plate 11 which are mentioned later, and the aperture 16 which is in agreement with the common ink room 19 and nozzle orifices 24 and 24, the free passage holes 17 and 17 which connect the pressure generating rooms 4 and 4 and 4 .. with 24 ...., and 17 .. are drilled.
[0016] The thickness which 18 is the above-mentioned common ink room formation plate, and was suitable for forming the common ink room 19, For example, the apertures 20 and 20 and 20 .... which branched to the plate equipped with the corrosion resistance of 150-micrometer stainless steel etc. in the shape of [corresponding to the configuration of the common ink room 19] abbreviation for V characters, The pressure generating rooms 4 and 4, the free passage holes 21 and 21 which connect nozzle orifices 31 and 31 and 31 .. with 4 ...., and 21 .. are drilled, and it is constituted.
[0017] The nozzle orifices 24 and 24 and 24 .. which 23 is a nozzle plate and are open for free passage to the 1 side twist of the pressure generating room 4 at each pressure generating rooms 4 and 4 and 4 ...., Two or more nozzle orifices 24'24 and 24' which are open for free passage to dummy pressure generating room 4' are drilled. a free passage -- a hole -- nine -- 13 -- 17 -- 21 -- 26 -- a free passage -- a hole -- nine -- ' -- 13 -- ' -- 17 -- ' -- 21 -- ' -- 26 -- ' -- minding -- each pressure generating rooms 4, 4, and 4 -- the common ink room formation plate 18 is pasted by the glue lines 25, such as a heat joining film, so that supply of the ink from .... may be received.
[0018] In addition, the flexible cable to which the sign 27 in drawing connects to the piezo-electric diaphragms 3 and 3 and the common electrode of 3 .... formed in a front face, and 29 connects each electrode and an external device is shown, respectively.
[0019] In this example, if a driving signal is impressed to the piezo-electric diaphragm 3, it will bend so that an elastic plate 2 may make the pressure generating room 4 side a convex, and the pressure generating room 4 will be shrunk. The ink of the pressure generating room 4 results in a nozzle orifice 24 via through-holes 9, 13, 17, and 21 by this, and it is breathed out as an ink droplet from here. In addition, since a driving signal is not impressed to dummy pressure generating room 4', ink does not carry out the regurgitation from nozzle orifice 24'.
[0020] If a driving signal is removed after ink droplet formation, the piezo-electric diaphragm 3 will return to the original location, and the pressure generating room 4 will expand. The ink of a part consumed by formation of an ink droplet by this flows into the pressure generating room 4 via the passage limit hole 12 from the common ink room 19. Hereafter, printing actuation is performed by such repeat.
[0021] on the other hand, when the case where ink dischargeability ability gets worse, and an ink tank exchanged, it was shown in drawing 4 -- as -- the cap member 28 -- a nozzle plate 23 -- pressing -- this -- negative pressure -- supplying -- nozzle orifices 24, 24, and 24 .... and actuation which eliminates the air bubbles which were made to discharge ink compulsorily from 24', and trespassed upon the blinding of a nozzle orifice 24, the ink room 19 common at the time of ink tank exchange, or the pressure generating room 4 are performed.
[0022] If discharge of such compulsory ink is performed, since each pressure generating rooms 4 and 4, the passage limit holes 12 and 12 which are open for free passage to 4 ...., and 12 .. are adjoined and prepared in wall surface 19a of the common ink room 19, the ink near the wall surface 19a will flow in from the direction which is distant from wall surface 19a with an adhesion viscous drag.
[0023] Since it flows and F1, F1, and F1 .... (drawing 3 (**)) arise, the air bubbles which leaned toward the common ink room 19 by this at one side and which trespassed upon the common ink room 19 ride this flow, are absorbed by the pressure generating rooms 4 and 4 and 4 .. from the passage limit holes 12, 12, and 12, and are

discharged outside from nozzle orifices 24, 24, and 24.
[0024] Moreover, in common trailer 19b of the ink room 19, passage limit hole 12', since 12' and 12' are formed, although the width of face of this field is wide to the cross direction of this, it flows into dummy pressure generating room 4', without producing stagnation (drawing 3 (**)). The big flow F2 which flows to the shaft orientations of the ink room 19 common to coincidence is also produced. Consequently, the air bubbles which are easy to stagnate to trailer 19b of the common ink room 19 are absorbed by dummy pressure generating room 4', and are promptly discharged from nozzle orifice 24', 24', and 24'.
[0025] Thus, the flow which compounded the flow which goes to the direction of ******, i.e., trailer 19b, and one wall surface 19a in the common ink room 19 will arise. The air bubbles of all the parts that trespassed upon the common ink room 19 this -- flow -- passage -- a limit -- a hole -- 12 -- 12 -- 12 .... 12 -- ' -- 12 -- ' -- 12 -- ' -- from -- a pressure -- generating -- a room -- four -- four -- four .. and -- a dummy -- a pressure -- generating -- a room -- four -- ' -- flowing in -- a nozzle orifice -- 24 -- 24 -- 24 .. 24 -- ' -- 24 -- ' -- 24 -- ' -- from -- the exterior -- discharging -- having -- ******** .
[0026] Therefore, since a common ink room and exclusion of the air bubbles which trespassed upon the common ink room, without extracting the trailer 19b especially are attained, sufficient compliance for a common ink room can be given.
[0027]
[Effect of the Invention] As explained above, while closing another side of the pressure generating room formation member which the closure of one field is carried out by the elastic plate and elastic plate which have a piezo-electric diaphragm on a front face, and form an oscillating member in it in this invention, and forms a pressure generating room, and a pressure generating room formation member While having the passage limit hole which gives passage resistance to the ink supply way to the 1st which is open for free passage in the both ends of a pressure generating room, the covering device material equipped with the 2nd free passage hole, and a pressure generating room A pressure generating room and the common ink room which is open for free passage in each pressure generating room through a passage limit plate and a passage limit hole equipped with the free passage hole open for free passage, And the common ink room formation plate equipped with the free passage hole which is open for free passage in a pressure generating room, In the ink jet type recording head which carries out the laminating of the nozzle plate equipped with the nozzle orifice connected to a pressure generating room through each free passage hole while closing the other sides of a common ink room formation plate to sequence, respectively, and it comes to fabricate to one While leaning and forming a passage limit hole in the wall surface side which is separated from the nozzle orifice side of a common ink room Since the dummy pressure generating room was made open for free passage and two or more passage limit holes were formed crosswise [of said common ink room] When discharge of compulsory ink is performed, the common ink interior of a room is made to produce the flow which leaned toward one side. Moreover, flow is produced to the limit [a trailer] of width of face, and the common air bubbles of the ink interior of a room can be eliminated promptly, therefore it becomes expandable [a common ink room], and sufficient compliance can be secured.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the decomposition perspective view showing one example of this invention.
[Drawing 2] Drawing (b) and (b) are drawings it is indicated that are about one example of this invention also at the cross-section structure of a pressure generating room and a dummy pressure generating room, respectively.
[Drawing 3] It is drawing showing the flow of the relation between a pressure generating room and a dummy pressure generating room, and a common ink room, and the ink when discharging ink compulsorily.
[Drawing 4] This drawing (b) and (b) are drawings showing the flow of the ink of the pressure generating room at the time of discharging ink compulsorily, and a dummy pressure generating room in equipment same as the above, respectively.
[Drawing 5] Drawing (b) and (b) are the sectional view showing an example of the conventional laminating mold ink jet type recording head, respectively, and drawing showing the flow of the ink in the common ink interior of a room at the time of forced discharge.
[Description of Notations]
2 Elastic Plate
3 Piezo-electric Diaphragm
4 Pressure Generating Room
The pressure generating room of 4' dummy
7 Pressure Generating Room Formation Member
8 Covering Device Material
9 2nd Free Passage Hole
10 1st Free Passage Hole
11 Passage Limit Plate
12 Passage Limit Hole
12' Passage limit hole which is open for free passage in a dummy pressure generating room
18 Common Ink Room Formation Plate
19 Common Ink Room
19a Wall surface
19b Trailer
23 Nozzle Plate
24 Nozzle Orifice
The nozzle orifice which is open for free passage in the pressure generating room of 24' dummy

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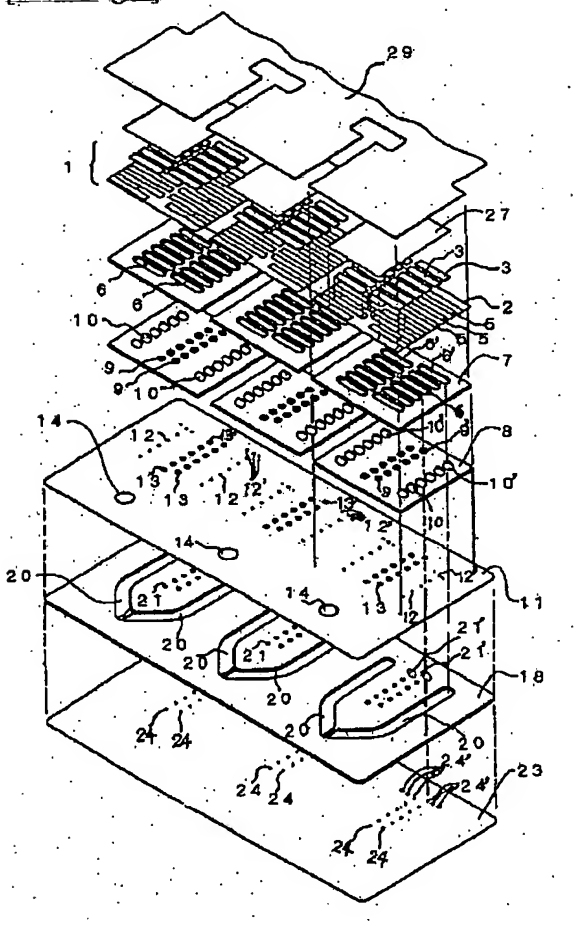
DRAWINGS

[Drawing 1]



[Drawing 2]

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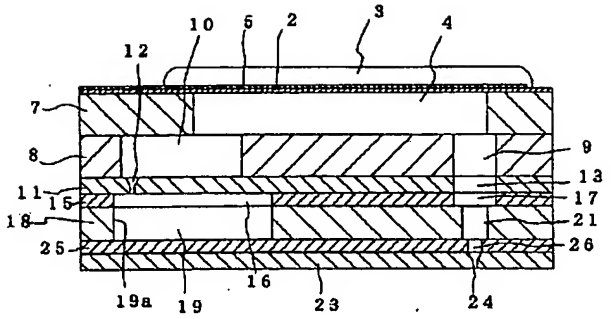

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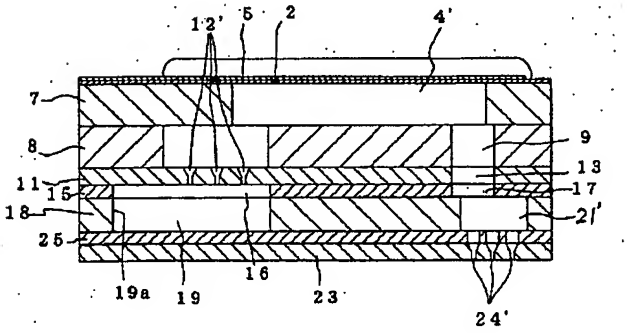
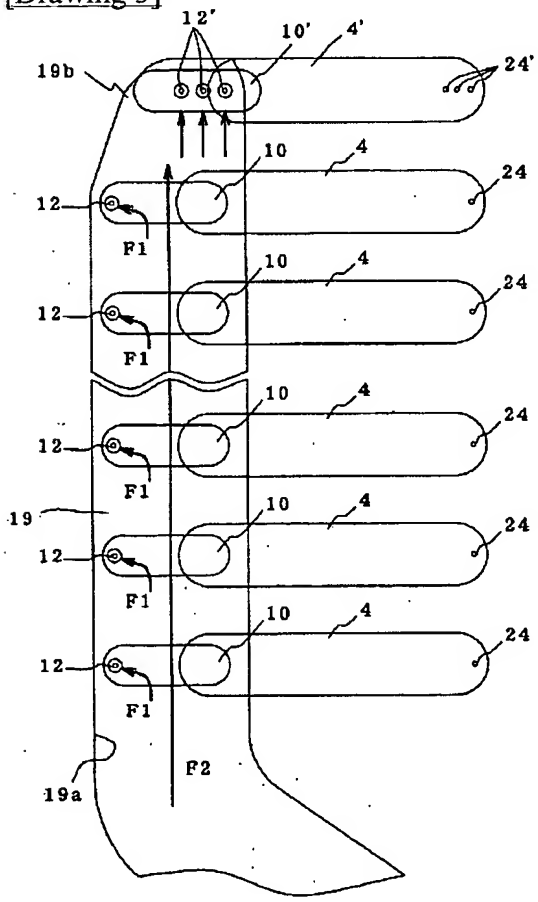
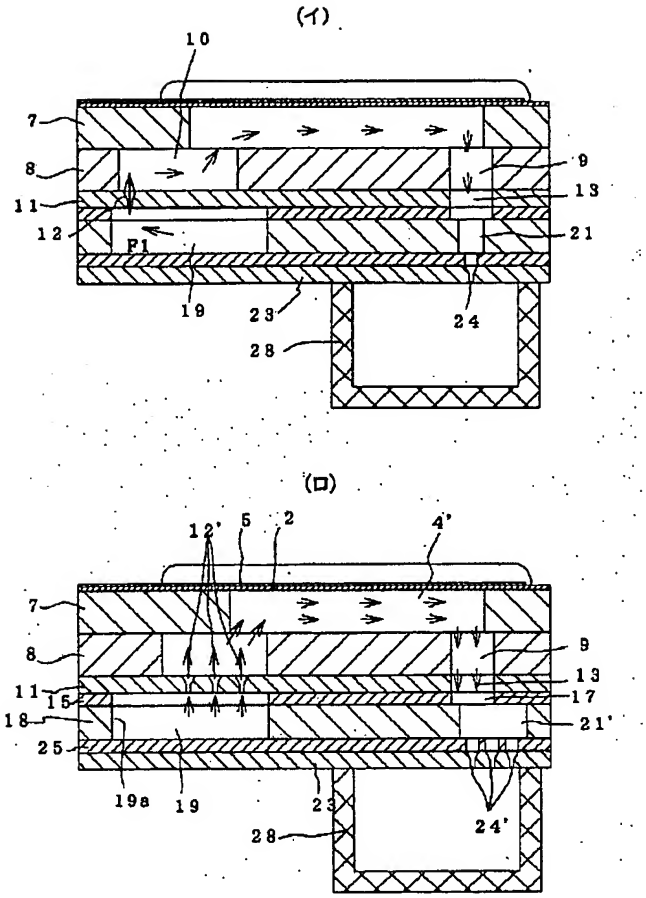


[Drawing 3]



[Drawing 4]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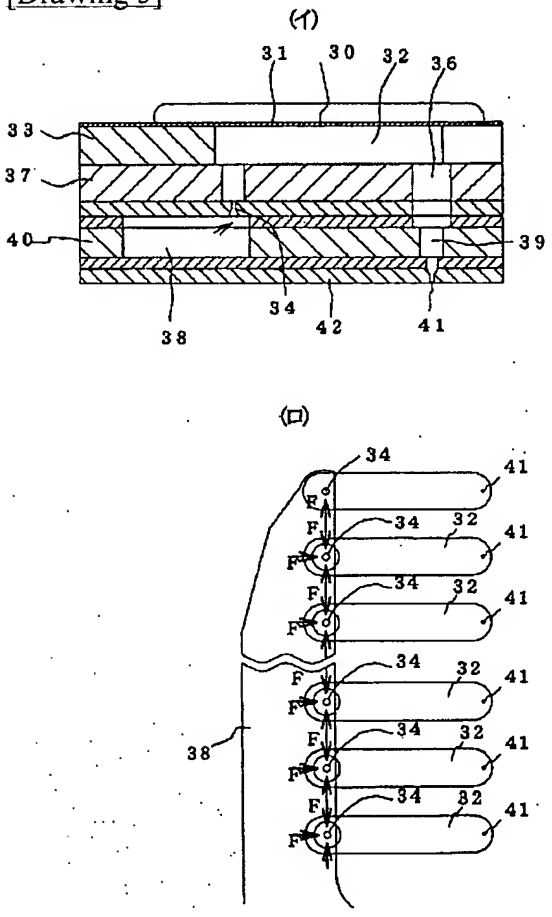
[Drawing 5]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